DOCUMENT RESUME

ED 242 873 CE 038 614

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TITLE State-of-the-Art Uses of Computers in Vocational Education in Ohio.
INSTITUTION Ohio State Advisory Council for Vocational Education, Columbus.
PUB DATE 84
NOTE 33p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Agricultural Education; Business Education; Career Education; *Computer Assisted Instruction; *Computer Literacy; Computer Managed Instruction; *Computer Oriented Programs; Computers; Curriculum; Curriculum Development; Educational Administration; Educational Cooperation; *Educational Needs; *Educational Practices; Home Economics; Microcomputers; Office Occupations Education; Postsecondary Education; Program Administration; School Business Relationship; Secondary Education; Special Education; Staff Development; State of the Art Reviews; Trade and Industrial Education; *Vocational Education
IDENTIFIERS *Ohio; Special Needs Students

ABSTRACT

A study explained the state-of-the-art uses of computers in vocational education in Ohio. During the study, assistant directors in the division of vocational education were asked to identify state-of-the-art uses of computers in schools and program service areas based on criteria for vocational computer and microcomputer literacy within the areas of agricultural, business and office, career, home economics, special needs, and trade and industrial education. In addition, the researcher interviewed staff at 12 sites throughout the state, including joint vocational schools in urban and rural settings and vocational programs in comprehensive high schools. Based on these interviews, it was concluded that the most successful programs were curricular and instructional programs that were marketplace driven and led by strong local advisory committees made up of business and industrial leaders. Significant variations were found to exist among and between state-of-the-art schools and program areas regarding the uses of computers and microcomputers and the potential envisioned. In addition, expenditures for computers and microcomputers varied dramatically from school to school. Recommendations were made calling for the development of multi-year computer plans and for the development of hardware and software configurations to support a comprehensive and integrated management information system that would wed administrative and instructional information. (MN)

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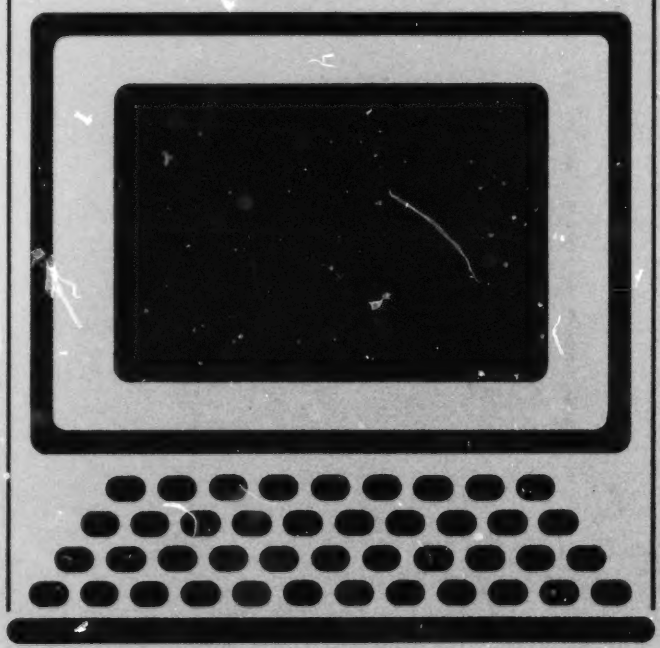
STATE-OF-THE-ART USES OF COMPUTERS IN VOCATIONAL EDUCATION IN OHIO



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The Ohio Advisory Council for Vocational Education 1984

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FOREWORD

Many educators are groping for leadership as to both the amount and place of computers/microcomputers in the educational program. This study is an exploration of the state-of-the-art of both the application and planning at this time. The information is obtained from selected schools and vocational program service areas. Significantly, the study also directs emphasis toward recommendations for further development.

Dr. James Lantz, who conducted this study for the Ohio Advisory Council for Vocational Education, found many vocational educators working diligently to develop mastery of the rapidly changing computer technology to meet educational and employment needs of students. He found that the programs varied widely among the service areas; however, generally they were driven by documented employment needs in the market place. Thus, advisory committees are assuming an important role.

Dimensions of basic and extended computer/microcomputer literacy have been validated in the study and recommended for use by the schools prior to instruction in vocational education. Curriculum materials should be developed that integrate computer technology into the instructional program. Criteria should likewise be proposed for selecting hardware and software, including possibilities for expansion and enhancement. Other recommendations of the study included additional training for teachers, informing employers of newly developed competencies of the students and continuing to base further development in the use of computers/microcomputers on market needs.

The Advisory Council trusts that this report will be of assistance to you.

Bonnie Johnson

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Chairperson

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Dr. Martin W. Essex
Executive Director

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PURPOSE OF THE STUDY AND RESEARCH QUESTIONS

The purpose of the study is to provide vocational educators with a practical reference on state-of-the-art computer/microcomputer uses in vocational schools. The study contains a description of "what is" in selected state-of-the-art schools and program service areas, as well as a glimpse of what is planned and the means for implementing the plans. In addition, the study seeks to answer the following research questions:

1. What are the dimensions of a working definition of computer literacy in vocational education?

2. What are the similarities among state-of-the-art schools in the vocational uses of computers/microcomputers?

3. What are the similarities among state-of-the-art program service areas in the vocational uses of computers/microcomputers?

4. What evidence is there that state-of-the-art vocational schools are modifying their curricular and instructional computer/microcomputer offerings to meet the needs of business and industry?

5. What are the strengths and weaknesses of the computer/microcomputer software used in the state-of-the-art vocational schools and programs?

6. To what extent are computer/microcomputer vendors used as resources in vocational computer education instruction and in curriculum development?

7. What provisions are made for retraining and updating staff in the state-of-the-art schools and programs including representatives from business, industry, labor, and the computer industry?

8. What evidence is there that vocational school graduates of state-of-the-art programs are obtaining employment based on computer/microcomputer training?

9. To what extent do vocational students receive certificates for completing work with computers/microcomputers, apart from diplomas? Are there problems with issuing such certificates?

10. What recommendations do educators; business, industry, and labor representatives; and vendors make for the future uses of computers/microcomputers in vocational education?

DESIGN OF THE STUDY

The following are the steps taken to meet the purposes of the study:

1. The literature was thoroughly reviewed.

2. A draft set of criteria for identifying state-of-the-art uses in schools and programs was developed. A working definition of vocational computer/ microcomputer literacy was likewise developed, also based on the review of the literature.

3. Both drafts were carefully reviewed through interviews with the Ohio Advisory Council for Vocational Education (OACVE) staff and four educators representing vocational education, technical education, and computer applications in education. Further, the drafts were reviewed through interviews with five representatives of major computer/ microcomputer firms that service the public schools.

4. The drafts were revised based on suggestions by the above persons.

5. Assistant directors in the Division of Vocational education were asked to identify state-of-the-art uses in schools and/or program service areas based on the revised criteria and definition of vocational computer/microcomputer literacy within their respective areas of responsibility that include the following:

   Agricultural education
   Business office education
   Career education
   Home economics
   Special needs
   Trade and Industrial education

   Twelve sites were visited throughout the state, including joint vocational schools (JVSs) in urban and rural settings and vocational programs in comprehensive high schools.

6. A structured interview instrument was developed, field tested, and revised based on suggestions received. The instrument was modified slightly for administrative/supervisory personnel and for instructional personnel.

7. Administrative personnel in the identified schools were contacted to secure permission to conduct onsite interviews with staff.

8. Instruments were mailed to the participants in advance to give them time to familiarize themselves with the content and to provide time to collect needed data.

9. Following the onsite interviews, the data were analyzed in terms of the purposes of the study.

REVIEW OF THE LITERATURE

To say that the literature is replete with books, journals, and articles regarding computer/microcomputer education is an understatement. To say that there is a paucity of material regarding state-of-the-art or exemplary uses of computers/microcomputers in vocational education is an accurate statement.

For the purposes of this study, the literature was reviewed with special attention to "exemplary," "state-of-the-art," "model," and "demonstration" uses of computers/microcomputers. Outstanding, out-of-the-ordinary uses were sought.

The writer was delighted to discover two outstanding reports entitled Microcomputers in Vocational Education: A Decision Guide[1] and An Administrator's Guide to Microcomputer Resources[2] both by Zahniser, Long, and Nasman, and published by The National Center for Research in Vocational Education. The reports should be helpful to all vocational educators faced with the task of clarifying the somewhat confused scene of computers/microcomputers in education. Further, the reports, taken together, provide extensive references and an annotated bibliography.

What is most needed is perspective on the matter of computers in education. The claims and counterclaims, recommendations and counter-recommendations, give vocational educators little help in solving the pressing problems of providing responsible, state-of-the-art computer education for students. Some perspective is gained by understanding the context in which the "microcomputer explosion" is occurring.

"The National Center for Education Statistics says that the use of microcomputers in schools has tripled since fall 1980. There are now 120,000 microcomputers available to students in 35 percent of the nation's schools. . . ."[3] And while one can find many who will support or decry the use of microcomputers, few will argue that the "microcomputer explosion" will mushroom unless there are countervailing financial forces.

To broaden the context, one needs to watch the impact and potential impact of high technology on vocational instruction. "Uncertainty" is the term that best describes the impact of high technology. "Rick Finholt, a consultant helping to

develop Ohio State University's high-technology research park, stated that 'we really don't know what the long-term effects will be.'"[4] The candor regarding "uncertainty" is more helpful than unfounded speculation in either direction.

To expand the perspective along two more continua, one must watch carefully what is occurring internationally in computer technology and what is predicted. While The Fifth Generation: Artificial Intelligence and Japan's Computer Challenge to the World cannot be adequately reviewed here, the reader is urged to read this substantive work, not only because it discusses where computer technology may be going but because it suggests the impact the new technology will have on jobs and job retraining.

While the authors of The Fifth Generation describe the desired Japanese labor force of the future, there can be little question that the U.S. information-based economy will also demand a "highly-literate work force, not necessarily college-trained, (and characterized by) worker flexibility and adaptability in the post-industrial society."[5] Notice that while we in the U.S. are attempting to deal effectively with information processing, the Japanese are challenging the more significant problem of knowledge production and processing.

With some of the broader dimensions briefly sketched, let us return to computer education, vocational education, and the immediate computer-related issues facing vocational educators.

Clearly, vocational educators will need to contend with a relatively low level of computer literacy exhibited by K-10 students for the next several years. While the level of computer education may be relatively unsophisticated in some K-10 programs, the level of sophistication is expected to change rather rapidly as staff and students accelerate along the learning curve. And while the new Minimum Standards for Elementary and Secondary Schools include a discretionary "may" regarding instruction in computer science, one can expect students from exemplary programs to challenge the knowledge and skills of Ohio educators.[6]

The scope of this study is restricted to the traditional focus of vocational education which is the concern for "job placement of its students immediately upon graduation from high school."[7] Also included is a brief look at adult vocational training and retraining.

Given the job placement aspect of vocational education, one is gratified and dismayed by the results of a recent study conducted by the Center for Public Resources and underwritten by major foundations and corporations -- gratified because the finding is what most educators believe in, dismayed because the belief has not been sufficiently acted upon. The study cites the ". . . 'surprising' recognition by both schools and business that companies would have to be more precise in defining job preparation requirements, in assisting with the development of curriculum and even in participating in classroom instruction."[8] The same study notes that "Changing technology has also compelled business to seek job applicants capable of handling more comprehensive tasks."[9] Shades of the description of the worker of the future may be found in The Fifth Generation above.

Naisbitt confirms that ". . . familiarity with computers is now considered a strong vocational advantage, a salable skill."[10] Certainly this notion is supported by McCormick's recent study in which he reported that "computer literacy and improvement in oral and written communications skills are essential for vocational education students."[11] But while the mention of oral and written communications skills communicates reasonably specific information to a vocational educator, the phrase "computer literacy" is far less clear. If the term is unclear to the educator, it is no clearer in the literature. What does become somewhat clearer, however, in the review of the literature as well as in the interviews with vocational educators, is that "vocational computer literacy" is somehow different from "general computer literacy" in grades K-10 or K-12.

In the 1982 Annual Summer Conference of the College of Education, University of Oregon, entitled The Computer: Extension of the Human Mind, David Moursund, professor of computer science, argues that ". . . all levels of education, starting perhaps as early as eight or nine year olds and continuing through the school system, university, and adult education (need) specialized courses for each group addressed."[12]

Particularly impressive was a series of seven reports under the general title of Technologies of the '80s. The seven reports

> identify major new and emerging technological advances expected to influence major vocational education program areas and to describe the programmatic implications in terms of skill-knowledge requirements, occupations most directly affected, and the anticipated diffusion rate.

Reports treat separately industrial, technical, office, home economics, health, distribution, and vocational agriculture occupations.[13] [14] [15] [16] [17] [18] [19]

The State of Utah Office of Education's Division of Vocational Education used telecommunications to enhance the delivery of services statewide. The telecommunications link provided access to large databases and further capitalized on the power of the microcomputer.[20]

Until now most of the material has focused on the computer/microcomputer as an instructional tool for the benefit of students, and to some extent as an aid to staff through computer-managed instruction (CMI); but the computer/microcomputer can perform many administrative tasks as identified in the Zahniser, et al report. Certainly word processing and electronic spreadsheets can serve vocational school administrators as well as they serve managers in business and industry.

CRITERIA FOR IDENTIFYING STATE-OF-THE-ART COMPUTER USES AND THE DIMENSIONS OF VOCATIONAL COMPUTER LITERACY

Assistant directors in the Division of Vocational education used the following criteria developed by the writer to identify schools and/or program service areas in which state-of-the-art computer/microcomputer uses were occurring or were planned. The criteria are presented in abbreviated form:

Schools

1. A three- to five- year plan for computer/microcomputer use with provisions to modify the plan
2. Board of education computer/microcomputer policy
3. Support for computer/microcomputer staff development
4. Integrated system of hardware and software
5. Curriculum guides in the program service areas that reflect computer/microcomputer use
6. Budgetary support for computer/microcomputer education
7. Provision for special needs students
8. An advisory committee(s) giving assistance in the direction to computer/microcomputer use
9. Local and national software selection and evaluation criteria

Program Service Areas

1. Employability advantage by being computer/microcomputer trained
2. Instructional time commitment to computer/microcomputer instruction
3. Provision for computer-based learning
4. Provision for computer-managed instruction

Basic Dimensions

The basic dimensions identified and used by the writer included:

1. Understanding the role of the computer/microcomputer in society and knowledge of the social, economic, political, and technological implication of the computer/microcomputer

2. Knowledge of the capabilities and limitations of the computer/microcomputer

3. Keyboarding skills

4. Knowledge of the skills in the use of the computer/microcomputer as a tool (problem solver), including knowledge of fundamental terms/vocabulary (the emphasis is to teach "with" the computer/microcomputer, not "about" the computer)

5. Awareness of the programming process, particularly with respect to data entry and retrieval, and the capability to perform fundamental computations, word processing functions, graphics, and simulations

6. Knowledge of careers and job opportunities and of trends related to the computer/microcomputer

Vocational educators generally agreed that they must assume responsibility for teaching basic computer literacy until students receive a solid grounding in the subject prior to entering vocational school. One vocational school is offering computer awareness for junior high/middle school students in a laboratory setting on the JVS site. Literacy instruction occurs most frequently in a laboratory setting with all students required to participate.

A number of educators support the importance of keyboarding skills and urged all students to develop such skills. Time, however, is not available within the vocational student day to permit extensive skill development. Typing software may help students improve speed and accuracy without continuous, direct instruction, particularly if open laboratory time is available.

While most supported using typewriters to teach microcomputer keyboarding, attention should be given to the differences between typewriter and microcomputer keyboards, particularly the function keys. Some consideration needs to be given to other input modes such as the touch screen, light pen, and "puck or mouse."

Adult, high school, and pre-high school students received substantially the same microcomputer literacy curriculum. For adults, more so than for nonadult students, there was anxiety about using microcomputers -- some adults are simply intimidated by the micro.

Extended Dimensions

Vocational administrators and staff perceived the following extended dimensions of computer literacy as important to a vocational education in general and/or to certain program service areas in particular. All felt that in the long run, the extended dimensions should be "integrated" or included as a part of the curricula in the several program service areas.

The following extended dimensions of computer literacy were validated by the vocational educators interviewed, with suggestions noted. The objectives of each service area may require a unique arrangement of the dimensions.

1. Knowledge of ethical and legal computer use consideration (such topics as software copyright and privacy of information should be dealt with)
2. Knowledge of innovative applications and uses of the computer
3. Keyboarding skills (reinforcing and extending skills developed earlier)
4. Extension of computational, word processing, graphics, and simulation capabilities
5. Knowledge of widely used software packages (for example, word processing and spreadsheets), their applications, and their ability to be customized
6. Data base use skills (information organization and manipulation skills, including data input and retrieval)
7. Skills associated with formal problem analysis by use of the computer/ microcomputer
8. Familiarity with a programming language (BASIC or PASCAL) and operating system or an introductory understanding of UNIX operating system and C Language as well as authoring languages (for example, PILOT)

The majority of persons interviewed said that knowledge of ethical and legal considerations should be a part of the extended dimensions. Knowledge of innovation applications and uses were believed important by the majority of participants.

Least agreement occurred on extending and reinforcing keyboarding skills. While a majority agreed upon its importance generally, the job relatedness of keyboarding should establish its placement and importance in the curricula.

Strong agreement exists about the importance of the extension of computational, word processing, graphics, and simulation capabilities. Again, strong support exists for knowledge of widely used software packages, their applications, and their ability to be customized.

Data base use skills are believed important by all but two respondents; however, use of commercial data bases in vocational schools is limited.

All agreed on the importance of skills associated with formal problem analysis by use of the computer/microcomputer.

No other single dimension generated as much discussion and as many undecided responses as the one dealing with "familiarity with a programming language (BASIC or PASCAL) and operating system or an introductory understanding of UNIX operating system and C Language as well as authoring languages (for example PILOT)." Increased agreement occurred among respondents when the term "familiarity" was emphasized, but most were reluctant to go beyond "familiarity" for all students. Disagreement or undecided responses occurred most in relation to the UNIX operating system, C Language, and authoring languages.

A clear majority felt that the extended dimensions of computer literacy were complete and suggested few changes. Vocational educators now have a benchmark for staff and curriculum development in basic and extended vocational computer literacy.

CONSOLIDATED DESCRIPTIVE DATA OF STATE-OF-THE-ART COMPUTER USES IN OHIO VOCATIONAL EDUCATION SCHOOLS

Application of Criteria to State-of-the-Art Schools

Three- to Five-Year Plans

This criterion was applied to determine the outstanding features of schoolwide computer/microcomputer plans and the specific provisions for obtaining input from business, industry, labor, and vendors as part of the plan or planning process. While few schools had three- to five-year computer/microcomputer plans per se, all supported the value of planning in spite of and because of the fluid computer/microcomputer environment. Some attempted to deal with computer planning within the five-year schoolwide plan for purchase of new and replacement equipment.

Some administrators insisted upon equipment purchases being driven by or preceded by curriculum development or revision and, in some instances, guided by schoolwide and/or ad hoc committees.

How does one ensure that advisory committee assistance with planning will enhance the vision and practicality of the plan? How does one ensure an appropriate balance between providing students with equipment that they will find on the job while preparing to provide the next generation of equipment in time to be in tune with adjustments in the marketplace? Broadly representative advisory committees will help ensure sound decision making coupled with participation by chief executive officers.

Vendors have a unique role to play in planning. Vendors should not only ask educators what they want the software and the hardware to do, but vendors must be prepared to educate the educators regarding what software and hardware can do.

One superintendent requires that all hardware and software must be compatible with the school's mainframe as a precondition to hardware/software selection. While this approach has resulted in not all staff getting their first choice of hardware and software, the school is able to benefit from compatible hardware and software.

In instances where a designated person was placed in charge of the computer/microcomputer planning effort, about one-half of the schools hired a person and the other half redefined, partly or in total, the responsibilities of a current staff member. Often the persons leveraged their efforts by identifying and working with a cadre of teachers in each subject area or school.

In part because of the rapid diffusion of microcomputers, skills of those giving leadership to computer literacy efforts have been developed primarily on the job, through workshops, seminars, and college/university courses. As a result, computer literacy planning and implementation exhibit a bias toward practicality at the expense of some vision or comprehensive perspective about what can be.

Board Policy and Regulation

No school had a computer/microcomputer policy; however, several schools were in the process of developing policies. For some, the policy will be a part of the local plan.

Temporary guidelines were developed as placeholders until the policy and/or regulations are developed. The guidelines restricted purchasing to certain brands, to compatibility of hardware and software, and to approval of expenditures over a specified dollar amount, regardless of the funding source. Approval of software was not required, but the dollar limitation remained.

Support for Staff Development

Most staff development for computer/microcomputer literacy was evenly divided between being held prior to student instruction or being held concurrently with student instruction. Staff development generally ranged from ten hours to eighteen hours, exclusive of special one-time presentations or university classes. A comprehensive overview of computers, including their capabilities and limitations, proves helpful before inservice on the specifics of hardware, software, or programming.

Some disagreement exists about the extent to which both staff and students need to learn programming skills, except in data processing. On several occasions, and with limited training, staff developed sufficient skills to write programs in BASIC for their instructional area.

In most cases administrators provided voluntary opportunities for staff to become computer literate, with the expectation that all staff would achieve the literacy objective. Most computer literacy efforts began in 1982, with the goal that all staff would be trained by the end of the 1983-84 school year.

The following are factors, based on the study, that vocational educators may wish to consider in planning staff development in computer literacy:

1. Give administrative leadership to the effort, including participation in the training
2. Recognize that some staff are clearly intimidated by the technology
3. Establish early that staff is responsible for integrating the technology, as appropriate, into their respective service areas
4. Establish that the computer/microcomputer is an instructional tool of significant magnitude and as such should be viewed as a tool within the context of each service area and not as an isolated abstract device
5. Conduct a marketplace needs assessment to establish the manner in which the computer/microcomputer is used and planned to be used and then structure staff development and curriculum development and revision accordingly
6. Fix responsibility by putting someone in charge of the computer literacy effort
7. Make the initial "hands on" experience with the computer a brief experience, perhaps not more than one hour, and make certain that it is a successful experience for the participants
8. Provide ample "hands on" opportunities with a skilled person(s) available to provide assistance, and conduct the staff development on the school site with graduate credit available
9. Include an evaluation component within the staff development effort

There are many other principles of sound staff development, but the above warrant particular attention when working with the computer/microcomputer.

Integrated System of Hardware and Software

Business and industry have long recognized the value of comprehensive and totally integrated management information systems (MIS), but analogous examples in education are few. Two schools were planning a system that would wed instructional

and management information. One school is currently coding the curriculum to the computer.

Development of an integrated system is constrained by the unavailability of comprehensive, modifiable educational software and by the cost of developing software from "scratch."

In spite of these limitations, vocational educators are urged to give careful consideration to the concept of a totally integrated management information system in which administrative and instructional information are wed. Clearly hardware and software decisions made today will advance or impede movement toward a MIS.

Use of an Advisory Committee(s)

Increased attention is being given or action taken to expand or to form separate advisory committees in light of emerging technologies. In some instances, respondents are reporting that they are not receiving community pressure for significant strides in computer-related technology, but they add that the absence of pressure may reflect the relatively depressed economic conditions in their locale.

Several schools have appointed recent graduates of their programs to the advisory committees and have found this action helpful. One school reported that advisory committee members who served on the PRIDE and North Central committees gave added impetus to the purchase of the relatively expensive and specialized computer-related equipment.

Additional Criteria

Participants were asked to suggest additions, deletions, and modifications to the criteria employed in the selection of state-of-the-art uses of computers/microcomputers. In the main, the criteria used in the identification process stood. The following are some suggested additions:

1. Emphasize linkages with other organizations such as universities and computer consortia
2. Build a strong evaluation component into the three- to five-year plan and into staff and curriculum development efforts

Use of Vendors as Resources

One superintendent strongly expressed the view that vendors need to "get out of a selling mode and into an educational mode". Educators need to learn what software and hardware can do before they can respond adequately to vendors' questions about what educators want computers to do.

Some vendors have been highly effective in staff development. In some instances, the staff development requirement was written into the hardware and software bid specifications.

Use of Outside Resources in Training and Retraining Staff and Graduates

Representatives from business, industry, and the computer industry are used to some extent in training and updating school staff and in training or retraining vocational graduates after employment. One administrator reported plans for such training in small business word processing applications.

No significant gaps exist between vocational training and entry level skills required by employers, other than the need to familiarize the graduate with the particulars of a specific firm or business, which most employers expect to do.

Employment Based on Computer Training and Issuance of Certificates

Most administrators indicate that they are not receiving a strong demand by employers for students to have computer literacy skills to ensure employment. The number of students who have completed computer literacy training to date is extremely limited.

Schools were almost equally divided between those that issue certificates to students for completing work in computers/microcomputers apart from the diploma and those that do not issue such certificates.

Schools that issue or plan to issue some form of recognition for computer literacy training or more advanced training are using or plan to use the following vehicles:

1. The Ohio Department of Education vocational certificate by completing the open-ended area on the back of the certificate, specifying the training received

2. A special certificate including performance based on competency levels

3. Notation on the student's transcript

4. An Adult Data Processing Evaluation Sheet with such information as keystrokes per hour with _____ % error rate, BASIC and COBOL programming activities, ability to perform flowcharting and to use peripherals, et cetera

Only two administrators reported that they saw problems in issuing a certificate. Concern centered on establishing specific competency levels.

Recommendations of the Administrators

Administrators were asked to make recommendations that would buttress the effective and efficient use of computer/microcomputers in education. The following summarize those recommendations:

1. Development of a computer/microcomputer skills projection in conjunction with business and industry as a keystone to staff development and to curriculum development and renewal

2. Assistance with three- to five-year planning that captures a vision of a comprehensive, integrated management information system (MIS)

3. Assistance with developing graded courses of study that show integration of the computer/microcomputer into the various program service areas

4. Development of three model hardware/software configurations that vary in sophistication but that support or potentially support a comprehensive and integrated management information system (MIS)

5. Development of uniform instructional software in accounting, for example, as a cost savings to schools and as a vehicle for establishing uniform competency standards

6. Development of a vehicle for allowing educators to access the plethora of software suitable for instruction and for evaluating its suitability

7. Access to good software tutorials for developing, reinforcing, and extending skills in English and mathematics

8. Additional assistance with staff development to reduce the amount of trial and error of on-the-job training by educators as they attempt to develop skills to use computer technology effectively and efficiently

DESCRIPTIVE DATA ON STATE-OF-THE-ART COMPUTER USES IN VOCATIONAL PROGRAM SERVICE AREAS

The data reported in this section describe briefly the uses of the computer in service area programs, each of which is in a different selected school.

Adult Agricultural Education

Respondents at this school generally agreed with the basic and extended dimensions of vocational computer literacy as presented, except for keyboarding skills, word processing, and familiarity with programming languages and operating systems.

This school offers farm business planning and analysis (FBPA) under the direction of two instructors, each of whom works with approximately forty area farmers. The instructors use a sophisticated microcomputer to teach farmers how to use a microcomputer for recordkeeping and production management. Most instruction is on a one-to-one basis.

Plans are to offer vocational computer literacy opportunities beginning in February 1984 with initial instruction in the use of data bases and spreadsheets allowing for "what if . . ." projections.

Agricultural educators need to teach what the computer can do for the farmer in the most practical ways, including the advantages and disadvantages of current software programs. Certainly the program described here exemplifies a pragmatic use of a sophisticated microcomputer for solving daily problems of the farmer while capturing a vision of what can be.

An interviewee expressed the need for software criteria, both for developers and consumers. Communications with vendors about the hardware and software needs of farmers is improving as well as communications about what is available and how it might help them.

Business Office Education (BOE)

Accounting

General staff development began in the summer of 1983 and is continuing throughout the 1983-84 school year on site. Two teachers were assigned per microcomputer for an eight-week period, twice a week. Instruction focused on BASIC I and II.

The mainframe and the micros are not networked, but networking is under consideration. The program operates with 12 "intelligent" terminals for 22 students during the day and 16 adult students at night. The program does not use dependent terminals, and there are no plans to purchase them. The microcomputers are also used to teach word processing.

The curriculum was developed based on a market survey in the county that showed a need for microcomputer accounting. The curriculum in turn is built around commercially produced micro and automated accounting software and workbooks. The materials are reported to be "user friendly" and relatively expensive but do not provide for skill evaluation. The most significant need is to establish competency standards.

Important to this state-of-the-art course was formation of a special advisory committee on microcomputers and the influence of teachers on the decision to purchase the particular hardware and software. Employers appreciate student training that is equipment specific and, of course, on equipment commonly used in area businesses.

Adult Computer Literacy

Reduction of anxiety about microcomputers is the initial task and is fundamental to future success in the course. Most adults are interested in developing practical skills needed to retain their jobs or to obtain promotions. The curriculum for this program closely parallels the dimensions of basic and extended computer/microcomputer literacy found reported earlier in the study.

Part of the adult education microcomputer education course in a second school includes CETA workers and Bureau of Vocational Rehabilitation students. This course has graduated eight students after 900 hours of instruction in an open entry, open exit program. The open entry, open exit approach is innovative and allows instruction to be tailored to student and employer needs. While many students are interested in learning about the mainframe, the interest in micros is increasing rapidly. The course includes the following areas: typing, data entry, filing, accounting, introduction to computers, BASIC programming, COBOL programming, mathematics, and job skills.

Banking

In this school the first major steps were under way in a banking program in which the school proposes to use software developed for and used in the industry rather than software that simulates the industry. The effort requires extensive cooperation between the school and, in this case, a major bank. The objective dictates equipment purchases compatible with the software. One of the unresolved problems is finding a match between micros and the industry software.

In addition to banking, the school is exploring applications in auto parts sales and service, catering and vending, and pet shop animal production and management built on the same objective.

Career Education

This career education project is housed in the JVS and primarily serves the career education needs of the constituent districts. Staff development in computer literacy is placed within the context of the developmental areas of career education which in turn is part of the five year career education plan of the vocational education planning district (VEPD).

The project director secured a grant from an area foundation that resulted in the systematic acquisition of microcomputers for the literacy training. One hundred fifteen staff members from the constituent districts and the JVS have been trained through December 1983. Additional training was provided by an area university. To date, 238 educators have received in excess of 4,500 hours of training.

The computer literacy course varied from six to nine weeks and included computer anatomy, basic programming, and social impact of the computer such as careers and technological implications.

The JVS board of education also agreed to use federal block grant monies to support computer literacy for staff and students. A committee was formed with representatives from BOE, T and I, adult education, special needs programs, and career education. Committee members meet with an eighteen member community advisory committee to obtain responses to the following:

If you were defining computer literacy for your employee, what would the definition be? As an employer, list the objectives you would outline in order to make your employees computer literate.

Space does not permit presentation of the ranked and weighted values of the responses; suffice it to say that involvement of the advisory committee reinforced the importance of including business and industrial leaders on the advisory committee and of involving them in the planning process.

"Staying close to the customer", in this case future employers, helped ensure instruction that is in tune with the needs of the marketplace.

Home Economics

The school district personnel, in cooperation with a state university, submitted a concept paper to a foundation established by a major computer manufacturer. The proposed project is to "1) help vocational home economics students develop computer competency and practical reasoning skills for solving home and family problems using _____ computer software, and 2) help home economics teachers create active learning environments while integrating computer usage throughout the home economics curriculum". ". . . students will learn: to ask questions, organize, retrieve, analyze and evaluate data, and justify decisions with reliable sources of information and facts."

Students, teachers, and family members would take pre- and post-tests. The university and district would communicate through the use of modems. "A teacher's guide, compatible with the new Ohio Practical Action Consumer-Homemaking Curriculum, will be developed in a university workshop."

The supervisor calls for recognition that students must be challenged to use the computer effectively while realizing that many jobs will remain relatively untouched by the computer. There is a requirement for both "high touch" and "high tech."

Vendors have been hard pressed to show practical uses of the microcomputer in home management beyond creating recipe files. The above proposal holds significant promise.

Administrative Applications for Managing Special Student Needs Information.

This innovative use of the microcomputer results from the extraordinary dedication of a vocational supervisor in a major city school district faced with the problem of sorting data to determine the extent to which the needs of handicapped students are being met. The VE-21 report form was previously completed by hand and involved hours of staff time. Now the VE-21 and VE-22 data are computerized. In addition, the supervisor has developed the software necessary to report the VESN 40/41 Accounting Report. The printout has been accepted by the Department of Education for the past two years.

Although not complete, work is progressing on the student follow up report. Absent the immediate possibility of putting this information on the mainframe, existence of micros with sufficient computing power makes it possible for one function of a large school district to computerize its operation. Plans are to link the microcomputer to the mainframe for information sharing.

Trade and Industrial Education

Drafting

Two computer-assisted design (CAD) programs were observed. The first program involved hardware and software, linked to the mainframe, and of the type generally found in a large firm. The program was initiated after careful review of local market needs. A special drafting advisory committee exists, composed in part of three former students who are currently working on CAD equipment.

The software is industrial grade rather than educational. Enhancements to the system are planned by the vendor. The vendor has provided inservice and manuals and is readily available to answer questions and solve problems. Another resource is the users' group that has developed around this particular vendor's equipment.

The second CAD program, also in its first year of operation, involves the purchase of a powerful general-purpose microcomputer used in local industry but not tied to a mainframe. This is in contrast to the hardware in the first school that was function specific with dedicated software.

The cost of the second machine was considerably less, and price was mentioned as a major consideration.

These two examples demonstrate that there is more than one avenue to meet the needs of students and of local industry. Each avenue carries a set of tradeoffs that must be carefully weighed.

Electronics

In this state-of-the-art course, students are taught to use the microcomputer as a problem solving device both for trouble shooting and for developing automated systems. Through programming in BASIC, students use formulae to meet both objectives. Students are required to "think through" the logic of the electronic components before attacking problems with the microcomputers. Further, students develop an understanding of the "big picture" or system by carefully developing an understanding of the components.

Medical Laboratory

The computer literacy effort in this jointure included instruction in programming with the objective that teachers write programs in their respective areas. As a result, the medical technology instructor wrote programs for a microcomputer that would be considered basic hardware. The software requires students to balance chemical formulae as part of their medical laboratory training. Teaching students to use microcomputers to retrieve data from medical data bases may also become a part of medical laboratory training.

This program demonstrates, as others have, that while all computer literacy is not learning to program, when even elementary programming is taught, some staff will extend that training skillfully to serve the needs of students. Further, this example demonstrates that even modestly priced microcomputers can be used to meet important instructional objectives.

CONCLUSIONS

1. The year 1984 promises to be a watershed year for the microcomputer industry and for the schools currently using computers/microcomputers. Schools currently struggling with computer literacy will become far more sophisticated in using the hardware and software and in understanding their potential.

2. The most successful examples are curricular and instructional programs that are marketplace driven and are programs that are led by strong local advisory committees made up of business and industrial leaders. A marketplace orientation and a strong local advisory committee provide a clarifying perspective on and a context for computer/microcomputer education. This conclusion gives focus to computer education in spite of the fluid environment.

3. The dimensions of basic and extended vocational computer/microcomputer literacy have been validated and a benchmark established.

4. Significant variations exist among and between state-of-the-art schools and program areas regarding the uses of computer/microcomputers and the potential envisioned.

5. Users of business or industry class software have been pleased with its instructional value even though in some instances it is not compatible with "educational" microcomputers. "Educational" software sometimes meets only 70 or 80 percent of the instructional objectives of a particular course.

6. Computer and microcomputer vendors are used primarily for staff development when specialized hardware and software is involved or for general microcomputer literacy when specified in the hardware/software bid. Vendors are seldom used in curriculum development or revision.

7. Business, industry, labor, and computer industry representatives play a limited role in retraining and updating school staff. Most training, retraining, and updating of school staff is conducted by colleagues who have acquired computer/microcomputer skills or by personnel from nearby colleges or universities. Most training by business and industry is limited to extending the skills of graduates to specific job requirements of the firm or company. Business and industry are interested in vocational schools conducting training for business and industry personnel, thus eliminating the need to establish "in house" training programs.

8. Schools generally are not reluctant to provide students with special recognition for computer/microcomputer training. Recognition, however, takes many forms. Some schools struggle with the question of how to portray computer/microcomputer competency.

9. While staff appears willing to give time to student computer/microcomputer literacy, hope is that these skills will be learned before students enter the vocational school and that specific computer/microcomputer skills will be integrated into the instructional programs of the several program service areas.

10. Expenditures for computers/microcomputers varied dramatically from school to school. Purchasing microcomputers to establish a laboratory was quite common.

RECOMMENDATIONS

The following recommendations should be directed to personnel of the State of Ohio Department of Education, school administrators, and teachers of vocational education for serious consideration:

1. Provide leadership to schools as related to:

   a. Development of an example of a three- to five-year computer plan that would include a draft policy and regulation on computers/microcomputers.

   b. Creation of three optional hardware/software configurations that vary in sophistication and support a comprehensive and integrated management information system (MIS), wedding administrative and instructional information.

2. Encourage all schools to establish computer/microcomputer literacy programs of high quality and have students complete such instruction prior to their enrollment in vocational education.

3. Urge colleges and universities to include instruction in computer/microcomputer literacy as part of their teacher preparation programs.

4. Provide additional training for and support to personnel assigned responsibility for leading the school's or district's computer/microcomputer vocational education effort.

5. Develop curricular materials that show how to integrate computer technology into the instructional program of each service area as appropriate.

6. Develop and disseminate criteria for personnel to consider when selecting hardware and software for vocational education, including such criteria as hardware expansion and enhancement capabilities.

7. Underwrite and reward innovative and creative uses of computers/microcomputers and publicize the efforts.

8. Communicate to employers that Ohio is developing a work force of computer/microcomputer literate vocational students and graduates with competencies specified.

9. Base staff development, curriculum development and renewal efforts on a thorough knowledge of market needs for computer/microcomputer trained employees.

10. Appoint persons with computer/microcomputer expertise on each school-wide and program specific advisory committee.

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